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ECHINODERMS FROM GREENLAND COLLECTED BY CAPT. ROBERT A. BARTLETT

By Austin H. Clark

For some years past Capt. Robert A. Bartlett on his annual cruise to the waters about Greenland has paid especial attention to the echinoderms, bringing back extensive and valuable collections. A report upon the collections received prior to 1936 has already been published (Journ. Washington Acad. Sci., vol. 26, pp. 294–296, figs. 1–4, July 15, 1936). The present report covers the material received since that date—909 specimens representing 18 species.

Most remarkable and unexpected of the species represented is a new *Leptasterias* belonging to the subgenus *Hexasterias*, which, except for the large *L. polaris*, was heretofore known only from the north Pacific. Almost equally noteworthy are 5 specimens of the little-known *Crossaster squamatus* from both eastern and northwestern Greenland.

The 18 species in the present collection are the following:

Ophiacantha bidentata.
Amphiura sundevalli.
Ophiopholis aculeata.
Ophiura sarsii.
Ophiura robusta.
Ophiocten sericeum.
Pteraster militaris.
Henricia sanguinolenta.
Crossaster squamatus.
Leptasterias bartletti, new species.
Leptasterias groenlandica.
Leptasterias sp.
Stephanasterias albula.
Poliometra prolixa.
Heliometra glacialis.
Strongylocentrotus dröbachiensis.
Cucumaria frondosa.
Myriotrochus rinkii.

LOCALITIES

WESTERN GREENLAND

I. Cairn Point, within 5 miles of the Arctic ice pack; rocky bottom; July 30, 1937.

II. Littleton Island, McGorey Island, Smith Sound Harbor; washings from kelp; July 30, 1937.

III. Between Cape Alexander and Cape Chalon; 25–40 fathoms; rocky bottom; August 2, 1938.

IV. Pandora Harbor, near Cape Alexander; August 5, 1937.

V. Off Sutherland Island (Inglefield), Smith Sound, near Cape Alexander; rocky bottom; July 28, 1937.

VI. Northumberland Island; August 7, 1937.

VII. Off Northumberland and Hakluyt Islands (approximately lat. 77°28′ N.); August 8, 1937.

VIII. Whale Sound; rocky bottom; July 28, 1937.

IX. Walrus grounds, Murchison Sound (approximately lat. 77°45′ N.); August 7, 1937.

X. Murchison Sound (approximately lat. 77°45′ N.); 45 fathoms; Rupert Bartlett, August 7, 1938.

XI. Walrus grounds, Murchison Sound (approximately lat. 77°42′ N.); August 7, 1938.

XII. Walrus grounds, Murchison Sound (approximately lat. 77° 38′ N.); August 8, 1938.

XIII. Murchison Sound; Hugh Byfield, August 7, 1938.

XIV. Murchison Sound; D. C. Nutt, August 7, 1938.

XV. Oelrich's Bay; muddy bottom; August 6, 1937.

XVI. Conical rock (lat. 76°03′ N., long. 67°30′ W.); 20–40 fathoms; D. C. Nutt and Rupert Bartlett, July 29, 1938.

XVII. Disko Island; muddy bottom; August 16, 1937.

XVIII. Off Prince Christian Sound (lat. 60°10′ N.); 90 fathoms; August 25, 1939.

EASTERN GREENLAND

XIX. Off Cape Farewell; 60–70 fathoms; August 25, 1939.

XX. Off Cape Farewell; 40–100 fathoms; August 25, 1939.

XXI. Off southeastern Greenland (lat. 61° N., long. 42°30′ W.); 80 fathoms; mud and pebbles; August 24, 1939.

XXII. Cape Tattershall, Liverpool coast; Dr. William Province, Jr., July 27, 1936.

XXIII. Booth Harbor, Cape Parry; July 27, 1936.

XXIV. Foster Bay, at the mouth of Francis Joseph fiord; 26 fathoms; Walter W. Kemp, August 2, 1939.

XXV. North fiord; August 2, 1936.

XXVI. North fiord; August 3, 1936.

XXVII. Francis Joseph fiord; August 4, 1936.

XXVIII. Mouth of Grant fiord, Payer Land; 14 fathoms; August 5, 1939.

XXIX. Off Cape Hold-with-Hope; 23–40 fathoms; Walter W. Kemp, August 6, 1939.

XXX. Greenland.

Note.—The catalog numbers of the specimens follow in parentheses the Roman numerals representing the localities.

OPHIUROIDEA

OPHIACANTHA BIDENTATA (Retzius)

Localities.—III (E.5785, E.5808). VI (E.5770). XI (E.5873). XII (E.5843, E.5855, E.5859, E.5860, E.5861). XIX (E.5724, E.5725, E.5726). XX (E.5703, E.5718, E.5719). XXI (E.5712). XXIX (E.5706). Thirty-eight specimens.

AMPHIURA SUNDEVALLI (Müller and Troschel)

Locality.—XX (E.5722). One specimen.

OPHIOPHOLIS ACULEATA (Retzius)

Localities.—III (E.5752, E.5784, E.5805). XII (E.5842). XVI (E.5866, E.5867). XVIII (E.5704, E.5705). XX (E.5701, E.5715, E.5716, E.5717). XXI (E.5713, E.5714). Thirty-six specimens.

Notes.—The largest specimen from locality III has the disk 22 mm. in diameter and the arms 95 mm. long; there are eight arm spines proximally.

OPHIURA SARSII Lütken

Localities.—III (E. 5764, E.5804, E.5807). V (E.5742). VI (E.5769). IX (E.5862). XI (E.5868, E.5859). XV (E.5768, E.5777, E.5783, E.5790). XXI (E.5723). Eighteen specimens.

Notes.—One of the specimens from locality V has the disk 25 mm. in diameter.

OPHIURA ROBUSTA (Ayres)

Localities.—I (E.5823). II (E.5761). III (E.5738, E.5739, E.5740, E.5747, E.5748, E.5750, E.5762, E.5763, E.5806, E.5829, E.5830). IV (E.5746). V (E.5741). VI (E.5749, E.5779, E.5780). VIII (E.5831). IX (E.5864, E.5876, E.5879). XI (E.5870, E.5871, E.5877). XII (E.5857, E.5858, E.5875). XV (E.5771, E.5772, E.5773, E.5774, E.5775, E.5776, E.5782, E.5786, E.5787, E.5788, E.5789, E.5791, E.5792, E.5793, E.5796, E.5797, E.5798, E.5800, E.5801, E.5802, E.5811, E.5812, E.5813). XVI (E.5865). XVII (E.5818). XXII (E.5836). XXVII (E.5834). XXIX (E.5708, E.5709). Three hundred and fifty-five specimens.

Notes.—One of the specimens from locality III (E.5739) is 6-rayed.

OPHIOCTEN SERICEUM (Forbes)

Localities.—III (E.5751, E.5819). IV (E.5745). V (E.5743). IX (E.5863). XI (E.5872). XII (E.5856). XXI (E.5711). XXII (E.5838). XXV (E.5840). XXVI (E.5835). XXVII (E.5833, E.5839). XXIX (E.5710). Two hundred and twenty-one specimens.

Notes.—One of the two specimens from locality V (E.5743) has the disk 18 mm. in diameter and the arms about 35 mm. long.

ASTEROIDEA

PTERASTER MILITARIS (O. F. Müller)

Localities.—I (E.5816). IX (E.5850). Two specimens.

Notes.—The specimen from locality IX (E.5850) has R=50 mm., r=20 mm.

HENRICIA SANGUINOLENTA (O. F. Müller)

Locality.—XX (E.5721). One specimen.

CROSSASTER SQUAMATUS (Döderlein)

PLATE 58

Localities.—III (E.5828). IX (E.5848, E.5849). XII (E.5851). XXIV (E.5702). Five specimens.

Notes.—In one of the specimens from locality IX (E. 5848) the rays are 10 in number; R=55 mm., r=23 mm. The abactinal skeleton is a wide-meshed reticulation of narrow bands in the interspaces of which are isolated rounded noncontiguous plates of various sizes. All the plates except the smallest bear spines, those on the smaller plates arising from slight elevations, those on the larger plates arising from high stout elevations with a hemispherical summit. The best developed paxillae have a central group of 13–15 long spines up to 4.3 mm. in length surrounded by a single or partially double row of 25–31 much shorter spines webbed at the base; a few spines of intermediate length are usually present. There are all gradations between these large paxillae and the paired or single small spines of the small plates. As the paxillae become smaller the long central spines decrease in length and stoutness and approach the peripheral spines in character. In a typical small paxilla there are 12–15 spines, the longest not more than one-third as long as the longest spines of the large paxillae, all of the same character, evenly graduated, the longest central about twice as long

as the shortest peripheral. The great variation in the size of the paxillae gives the abactinal surface a curious appearance. The spines on the inferomarginal plates are up to 4.5 mm. in length.

In the second specimen from locality IX (E. 5849) there are 10 rays; R=50 mm., r=20 mm. This specimen resembles the preceding. In the central portion of the abactinal surface the plates, larger and smaller, are more or less evenly spaced over the surface, no reticulate arrangement being discernible, and the paxillae are mainly of two sizes, large and intermediate, most of them the latter. On the outer half of the disk and on the arms there is a regular very open reticulation of narrow bands with isolated and scattered small plates in the interstices. Here the paxillae are more definitely differentiated into larger and much smaller, the latter on the bands between the larger and on the isolated plates in the interspaces.

In the specimen from locality XII (E. 5851) there are 10 rays, one of them only half grown; R=16 mm., r=7 mm. The abactinal skeleton is reticulate with large interspaces, which become larger on the arms. Within these interspaces are rounded isolated plates of various sizes, usually one or two, sometimes a few more, in an interspace. When small these plates are merely rounded calcareous nodules; when larger they bear according to size one to six long slender spines resembling those of the paxillae but shorter and slenderer. The paxillae bear 7–20 (most commonly 10–15) long slender spines of which the central five are much longer and stouter than the peripheral and are serrate in the outer half; the large central spines intergrade with the very short and slender peripheral.

In the specimen from locality XXIV (E. 5702) (see pl. 58) there are 11 rather slender rays; R=60 mm., r=25 mm. The abactinal skeleton is composed of a great number of small plates of various sizes, evenly rounded or with broadly rounded angles, that are continguous or more or less strongly overlapping, forming an almost complete investment. On the disk there is no suggestion of a recticulate arrangement, but on the rays the plates tend to group themselves in a close-meshed reticulation with four to six smaller plates radiating from the periphery of the larger paxilla-bearing plates. Along the sides of the arms there is a tendency for the plates to become arranged in irregular transverse bands, paxilla-bearing plates being connected by single plates without paxillae. The smaller plates gradually become less numerous, and in the outer portion of the arms only evenly distributed, almost or quite contiguous, paxilla-bearing plates remain. The larger plates on the abactinal surface bear paxillae consisting of a high rounded boss bearing 5–10 (usually 7–9) long spines 1.7 mm. in length. These spines are commonly subequal, but a few of the peripheral may be shorter than the central. Some

of the smaller plates may bear one to five shorter and slenderer spines, and a few may bear as many as 15 spines. Going out along the arms the number of spines in the paxillae gradually decreases until, near the arm tips, the paxillae bear only one to three spines, and still further out only one or two.

Crossaster squamatus is probably only an extreme form of the widespread and very variable *C. papposus*, in spite of the fact that its general appearance is very different.

LEPTASTERIAS (HEXASTERIAS) BARTLETTI, new species

PLATE 59

Description.—Arms 6; R=25 mm.; r= 8 mm. The abactinal skeleton is irregularly and evenly reticulate with no indication of a carinal series of plates, the papular areas small and often containing small, isolated, rounded plates. The area occupied by the plates is of about the same size as, or perhaps greater than, that occupied by the papular areas. Just above the row of superomarginals there is a regular row of rather large papular areas (the supramarginal groove) resembling those in the row between the superomarginals and inferomarginals (the intermarginal groove). A row of actinal plates, which at first are as large as the inferomarginals but rapidly decrease in size, extends to about the middle of the arm.

The abactinal spinelets are numerous, one to five or even six (usually one, two, or three) to a plate. They are small and short, two to four (usually about three) times as long as broad, cylindrical with roundedly truncate, spinous, and often striate, tips. The variation in length and slenderness is relatively slight so that the entire aboral surface presents a uniform covering of fine short spines.

The superomarginal spines are somewhat longer and stouter than the abactinal spines, though of the same character. There is usually one to a plate, though sometimes in the middle of the arm this is accompanied by one or even two smaller and slenderer ones. The inferomarginals bear spines resembling those of the superomarginals though slightly larger and stouter and slightly curved distally. There is usually one to a plate, but in the middle of the arm often two are present. There is a row of 9–11 actinal spines, one on each plate. These at first resemble the spines on the inferomarginals but outwardly decrease in size and disappear at about the middle of the arm.

The adambulacral plates each bear two spines, which are slenderer than those on the inferomarginals, though of about the same length; the inner spine, at the furrow edge, is slenderer and slightly longer than the outer. The pairs of spines on successive plates are alternately nearer to and farther away from the furrow.

The mouth plates bear three long spines of which the two outermost are subequal and the innermost, at the apex of the plate, is shorter and slenderer.

On the abactinal surface each spine bears one to four (usually two or three) small crossed pedicellariae, and others occur here and there on the plates between the spines. The superomarginal spines bear one to nine (commonly four to six) pedicellariae in a circlet at about the middle. The inferomarginal spines bear one to five (commonly three or four) pedicellariae, which are more or less confined to the side toward the arm tip. The spines on the actinal plates carry usually two or three pedicellariae, mainly on the side away from the furrow. The spines on the adambulacral plates are mostly without pedicellariae, though many carry one, situated usually at or near the base. Each adambulacral plate bears a straight pedicellaria situated within the groove at a little distance below the base of the inner spine. These pedicellariae alternate higher and lower along the groove.

Crossed pedicellariae are numerous abactinally and laterally. Straight pedicellariae occur within the ambulacral groove, on and among the adambulacral spines, in the interradial areas, and on the abactinal surface of the disk where they are attached to the plates. They are all small. The largest are in the interradial areas and on the abactinal surface of the disk where, however, they are not numerous.

The crossed pedicellariae have the proximal half of the jaw narrow and the distal half abruptly expanded with a smooth semicircular distal edge, giving somewhat the impression of a horse's hoof. The basal portion, approximately at right angles to the jaw, is somewhat longer than the latter, measuring from the constriction between the two portions.

Viewed from the interior the valves of the straight pedicellariae are seen to have the sides parallel for the proximal two-thirds, thence curving to an oval more or less broad tip. The sides may be smooth or finely serrate, and the tip may be smooth or with the center turned inward and produced into a point.

Locality.—Between Cape Alexander and Cape Chalon, northwestern Greenland; 25–40 fathoms; rocky bottom; Capt. Robert A. Bartlett, August 2, 1937 (type, U.S.N.M. No. E.5753).

Notes.—This species belongs to the *Camtschatica* section of the subgenus *Hexasterias*, typified by *L.* (*H.*) *camtschatica*, which heretofore was known only from the coasts bordering the north Pacific and the southern Bering Sea. It is not very closely related to any of the north Pacific or Bering Sea species.

It is easily distinguished from *L. polaris* of the same size. The abactinal spines are cylindrical, not more or less capitate as in

L. polaris. The spines are paired on practically all the adambulacral plates, not alternating two and one as is usual in small *L. polaris*, and these spines are slightly longer than the inferomarginal spines instead of slightly shorter as is the case in *L. polaris.* The row of furrow pedicellariae seen in *L. bartletti* does not occur in *L. polaris.* The crossed pedicellariae are more expanded distally, and the straight pedicellariae are markedly longer than those of *L. polaris.*

From *L. groenlandica* it is easily distinguished, aside from the larger number of arms, by the irregular and close-meshed skeleton and the abundant abactinal pedicellariae, especially on the disk, as well as by the double adambulacral spines.

In addition to numerous 5-armed specimens of *L. groenlandica* there is at hand for comparison one with six arms from Etah, Greenland, collected by Walter Koelz on August 2, 1925 (U.S.N.M. No. E.1251).

LEPTASTERIAS (LEPTASTERIAS) GROENLANDICA (Lütken)

Localities.—II (E.5760). XV (E.5744, E.5799, E.5803). XX (E.5720). Six specimens.

LEPTASTERIAS (LEPTASTERIAS) species

Locality.—VI (E.5832). One specimen.

Note.—This specimen is too young for definite determination.

STEPHANASTERIAS ALBULA (Stimpson)

Localities.—II (E.5759). III (E.5756, E.5767, E.5809, E.5817). IV (E.5755). XI (E.5847). XII (E.5846, E.5854, E.5874). Fifty-nine specimens.

Notes.—The largest specimens, in which R=25 mm., are from localities XI (E.5847) and XII (E.5846). From these two localities there are three specimens with seven rays.

CRINOIDEA

POLIOMETRA PROLIXA (Sladen)

Locality.—XXI (E.5736). Three specimens.

HELIOMETRA GLACIALIS (Leach)

Localities.—III (E. 5758, E.5815, E.5825). VII (E.5843). VIII (E.5814). IX (E.5844). XI (E.5845). XII (E.5841, E.5842). XIX (E.5729). XXI (E.5735). Thirty-nine specimens.

Note.—The largest specimens, with arms up to 230 mm. in length, are from localities IX and XI.

ECHINOIDEA

STRONGYLOCENTROTUS DRÖBACHIENSIS (O. F. Müller)

Localities.—I (E. 5822). III (E.5737, E.5754, E.5757, E.5766, E.5781, E.5810, E.5820, E.5821, E.5826). VIII (E.5824). X (E.5878, E.5880). XV (E.5778). XIX (E.5730). XX (E.5731, E.5732). XXII (E.5836). XXVIII (E.5734). XXIX (E.5707). One hundred and eight specimens.

HOLOTHUROIDEA

CUCUMARIA FRONDOSA (Gunnerus)

Localities.—III (E.5885). X (E.5882). XI (E.5881). XIII (E.5884). XIV (E.5883). XXI (E.5733). Six specimens.

MYRIOTROCHUS RINKII (Steenstrup)

Localities.—VI (E.5888, E.5889). XXIII (E.5890). XXVI (E.5887). XXVII (E.5886, E.5891). Nine specimens.

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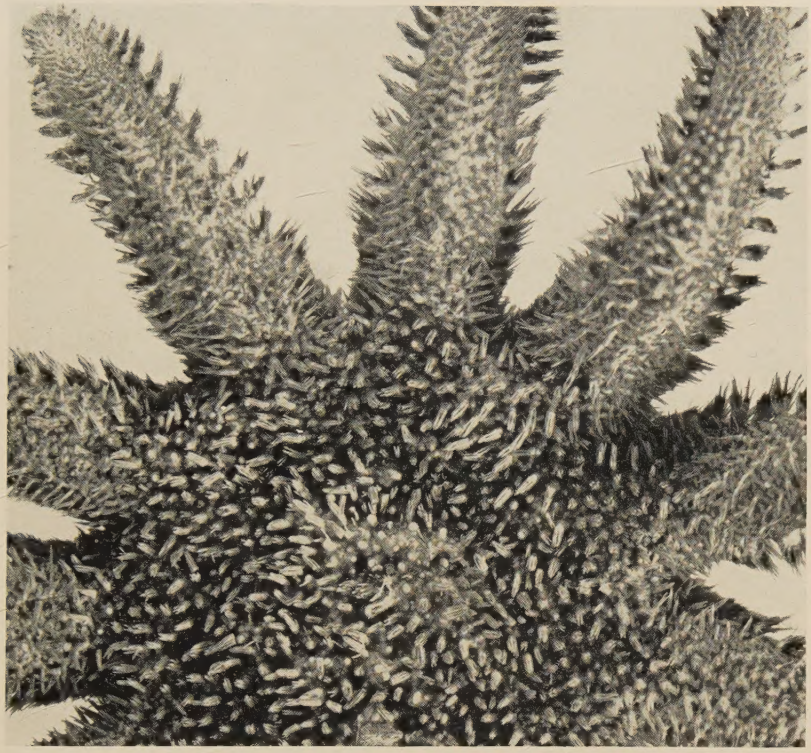
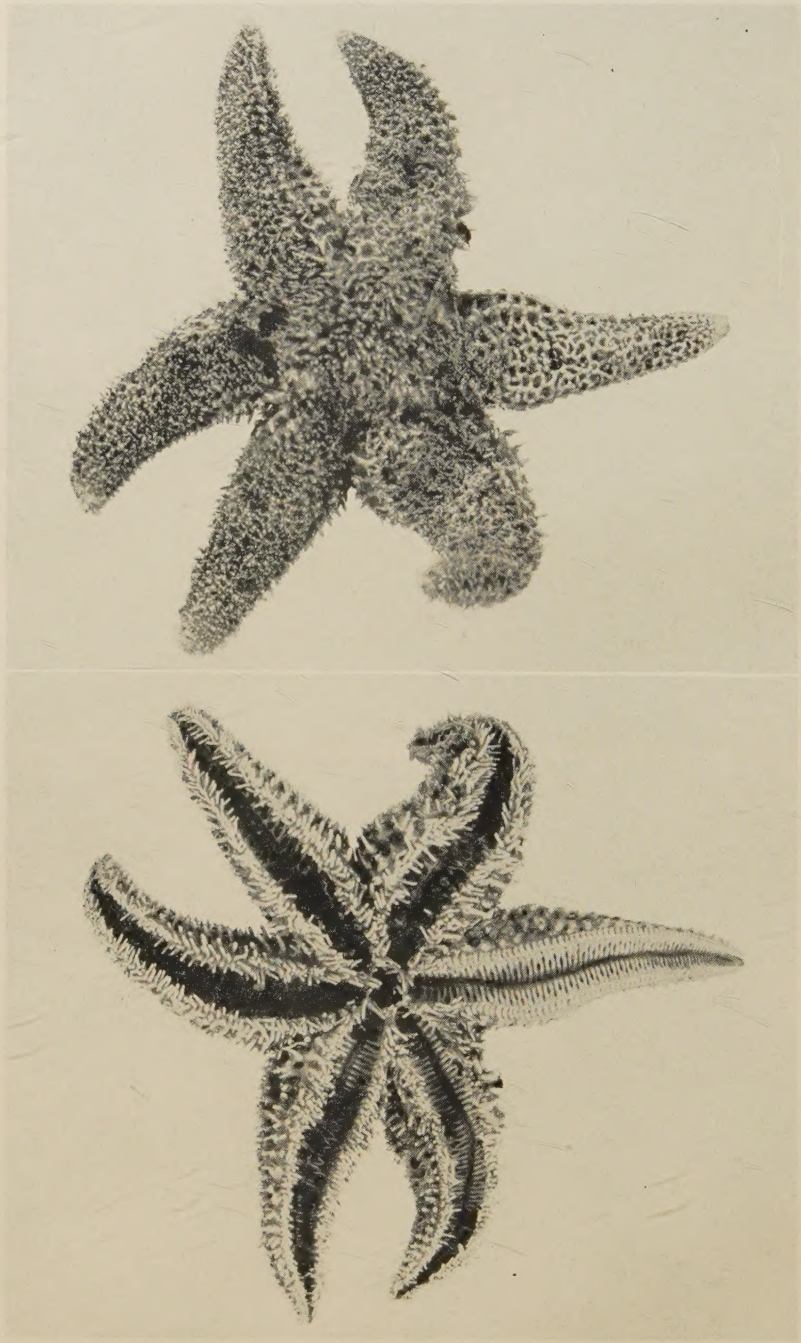


CROSSASTER SQUAMATUS (DÖDERLEIN).

Aboral (upper) and oral (lower) sides. × 2.



LEPTASTERIAS (HEXASTERIAS) BARTLETTI, NEW SPECIES.

Aboral (upper) and oral (lower) sides; arm at right cleaned to show skeletal structure . × 2.